AMENDMENTS

Please amend the application as indicated hereafter.

In the Specification

Please amend the specification as indicated below. The language being added is underlined ("___") and the language being deleted contains strikethrough ("—"):

For the paragraph beginning at page 17, line 14:

Gesture Recognition

Several embodiments of image capturing systems and methods have been described, and the following provides additional detail as to the implementation of the gesture recognition which may be used therein. As discussed above, the recognition system may incorporate two kinds of gestures: control gestures and user-defined gestures. Control gestures provide continuous control of a device, and user-defined gestures which may be recognized by HMMs provide discrete output for the single gesture.

In general, data may be gathered by scanning an image from a camera line by line. The algorithm used to find a blob in the image may look for a pixel with a predetermined color. In the case of a black and white camera (and sufficient illumination) the predetermined color may be a saturated white. Given an initial pixel as seed, the algorithm may grow the region by checking if any of its neighbors are white. If a region grows above a certain mass, it may be considered a blob and certain statistics may be computed for it. For example, the statistics may include the eccentricity of the bounding ellipse, the angle between the major axis of this ellipse and horizontal, the length of the

ellipse's major and minor axes, the distance between the blob's centroid and the center of its bounding box, and the angle determined between horizontal and the line drawn between the centroid and the center of the bounding box.

Control Gestures

It is preferable that control gestures are simple because they are interactive and will likely be used more often. User-defined gestures, on the other hand, may be more complicated and powerful since they will likely be used less frequently.

As indicated above, control gestures may be used for continuous output to devices. For example, a volume control on a stereo may be controlled using a control gesture. Gestures described by HMMs are discrete and may indicate an action, but in some embodiments will not let the action proceed in increments. Thus, in some embodiments, to get a continuous control effect, the gesture would be repeated. With a control gesture, on the other hand, the displacement of the gesture may determine the magnitude of the action.

The set of features used for control gestures include the eccentricity, major and minor axes, the distance between the blob's bounding box's centroid and the blob's centroid, and the angle of the two centroids.

Some exemplary gestures may include hand poses consisting of: "vertical pointed finger" (VF), "horizontal pointed finger" (HF), "horizontal flat hand" (HFH), and "open palm" (OP). Exemplary gestures may be "horizontal pointed finger up," "horizontal pointed finger down," "vertical pointed finger left," "vertical pointed finger right," "horizontal flat hand down," "horizontal flat hand up," "open palm hand up," and "open

palm hand down." The gestures are determined by continual recognition of hand poses and the hand movement between the frames.

Using these exemplary hand poses and gestures, assuming independence, random chance would result in an accuracy of 25 percent. The Nearest Neighbor algorithm may be used for pattern recognition. The training and test sets may be obtained in the same manner, and both sets may be taken independently. In the above example, a training set may consist of 1,000 examples per hand pose for a total of 4,000 examples. Test set may consist of 117 examples of VF, 129 examples of HF, 134 examples of HFH and 126 examples of OH. Under these circumstances, the test and training set may result in a 95 percent correct classification of the gestures.

User-Defined Gestures

The user-defined gestures may be one or two handed discrete actions through time. Thus, in addition to the features used for the control gestures, the blob's identity, mass, and normalized centroid coordinates are added, but in some embodiments, calculations with the bounding box may not be used. HMMs may be used for recognition, and the network topology of the HMM may consist of three states, where the first state can skip to the third state.

The system allows the user to define more complicated gestures. However, these gestures may control discrete rather than continuous tasks since the gesture is defined partly by its range of motion. For example, in one embodiment, a gesture for "fire on," "fire off," "door open," "door close," "window up," "window down" may be defined. In this embodiment, for each gesture, 15 examples may be obtained using the blob tracking algorithm. Ten of the examples may be randomly chosen as the training set to train the

set of 6 HMMs, and the other 5 examples may be used for testing. An accuracy of 96 percent may be achieved with these 6 gestures.